



U.S. Department  
of Transportation

**Federal Aviation  
Administration**

**FAA-S-8081-28A**

# **AVIATION MECHANIC POWERPLANT**

## **Practical Test Standards**

**July 2012**

**FLIGHT STANDARDS SERVICE  
Washington, DC 20591**



**AVIATION MECHANIC  
POWERPLANT  
PRACTICAL TEST STANDARDS**

**2012**

**FLIGHT STANDARDS SERVICE  
Washington, D.C. 20591**



## **NOTE**

FAA-S-8081-28A, Aviation Mechanic Powerplant Practical Test Standards (PTS) supersedes FAA-S-8081-28 dated June 2003.

This PTS will be effective November 1, 2012.

## **MAJOR ENHANCEMENTS**

- Removed the core competency element requirements (objective 2) for each subject area.
- There are now only 2 objectives for each subject area:
  - Objective 1: Exhibits knowledge in, oral elements.
  - Objective 2: Demonstrates skill to perform practical elements.
- Added and/or revised elements within objective 2 to expand the selection of projects for the DME.
- Added new subject area “M” Human Factors/Maintenance Resource Management (MRM).
- Revised introduction to include International Civil Aviation Organization (ICAO) references to aircraft maintenance performance, eligibility, skill, knowledge, and experience requirements.
- Updated references to FAA orders, instructional materials, and inspector guidance.



## FOREWORD

This Aviation Mechanic Powerplant Practical Test Standards book has been published by the Federal Aviation Administration (FAA) to establish the standards for the Aviation Mechanic Powerplant Practical Test. The passing of this practical test is a required step toward obtaining the Aviation Mechanic Certificate with a Powerplant rating. **FAA inspectors and Designated Mechanic Examiners (DMEs) shall conduct practical tests in compliance with these standards.** Applicants should find these standards helpful in practical test preparation.

/s/ 7/30/2012  
Raymond Towles, for

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John Allen, Director  
Flight Standards Service



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## INTRODUCTION

The Federal Aviation Administration (FAA) aircraft mechanic's oral and practical test(s) are outcome-based examinations. Before being issued any airframe and/or powerplant certificate, all applicants must demonstrate the minimum level of knowledge and skills for the rating sought.

Skill tests are significant as they measure the applicant's ability to logically think and objectively apply their knowledge, while demonstrating the physical skills that enable them to carry out aircraft maintenance in a professional and safe manner.

Satisfactory demonstration of each skill test is evidence the applicant meets the acceptable degree of competency for the certificate or rating sought.

This PTS is available for download, free of charge, at:

[www.faa.gov](http://www.faa.gov)

Comments regarding this PTS should be sent to:

[AFS630comments@faa.gov](mailto:AFS630comments@faa.gov)

-OR-

U.S. Department of Transportation  
Federal Aviation Administration  
Regulatory Support Division  
Airman Testing Standards Branch, AFS-630  
P.O. Box 25082  
Oklahoma City, OK 73125

## Practical Test Standard Concept

Title 49 U.S. Code, Subpart III, Chapter 447 is the foundation for the FAA's safety regulations, and provides flexibility through FAA Order 8900.2, General Aviation Airman Designee Handbook, to examine and issue an airman certificate. This order is policy and mandatory standardized procedures for those who administer all aviation mechanic oral and practical tests.

**NOTE: A designee conducting an oral and/or practical test must not test more than one applicant at a time, unless authorized in accordance with FAA Order 8900.1, *Flight Standards Information Management System* and FAA Order 8900.2.**

Definitions within:

- **Competency**—a combination of skills, knowledge, and attitudes required to perform a task to the prescribed standard.
- **Knowledge** (oral)—elements are indicated by use of the words "*Exhibits knowledge in....*"
- **Skill**—(practical) elements are indicated by the use of the words "*Demonstrates the skill to perform....*"

This practical test book is a variety of technical projects or tasks containing subject areas included in the FAA written knowledge test as the current minimum required curriculum, which is prescribed in Title 14 of the Code of Federal Regulations (14 CFR) part 147 appendices.

Compliance with these procedures makes certain that airman applicants meet a satisfactory level of competency and workmanship required for certification.

Every applicant is required to demonstrate a minimum satisfactory competency level, regardless of their previous education background.

Adherence to the following standards is mandatory when evaluating an applicant's test performance for an FAA Airframe and/or Powerplant Certificate:

- International Civil Aviation Organization (ICAO) Annex 1: 4.2.1.5
- 14 CFR part 65, section 65.79
- FAA Order 8900.2

All applicants for an FAA Aviation Mechanic Certificate must qualify by meeting the prescribed requirements as stated in 14 CFR part 65, section 65.77. They must additionally pass a written knowledge test, and the oral and practical tests for the certificate and/or rating sought, in accordance with the following standards:

- ICAO Annex 1: 4.2.1.3
- 14 CFR part 65, section 65.77

FAA written knowledge tests contain topics that include the construction and maintenance of aircraft, relevant FAA regulations, basic principles for installation and maintenance of propellers, and powerplants, depending on the certificate and rating sought, based on the following standards:

- ICAO Annex 1: 4.2.1.2
- 14 CFR part 65, section 65.75

Aviation maintenance instructors and applicants should find these standards helpful during training and preparing for the skill test, which are required under 14 CFR part 65, section 65.79.

#### Reference List:

<b>14 CFR part 1</b>	Definitions and Abbreviations
<b>14 CFR part 3</b>	General Requirements
<b>14 CFR part 21</b>	Certification Procedures for Products and Parts
<b>14 CFR part 39</b>	Airworthiness Directives
<b>14 CFR part 43</b>	Maintenance, Preventive Maintenance Rebuilding and Alteration
<b>14 CFR part 45</b>	Identification and Registration Marking
<b>14 CFR part 47</b>	Aircraft Registration
<b>14 CFR part 65</b>	Certification: Airmen Other Than Flight Crewmembers
<b>14 CFR part 91</b>	Air Traffic and General Operating Rules
<b>AC 20-62E</b>	Eligibility, Quality, and Identification of Aeronautical Replacement Parts
<b>AC 39-7C</b>	Airworthiness Directives
<b>AC 43.13-1B</b>	Acceptable Methods, Techniques and Practices A/C Inspection & Repair
<b>AC 43.13-2B</b>	Acceptable Methods, Techniques and Practices- Aircraft Alterations
<b>FAA-H-8083-30</b>	Aviation Maintenance Technician Handbook— General
<b>FAA-H-8083-32</b>	Aviation Maintenance Technician Handbook— Powerplant
<b>ICAO</b>	International Civil Aviation Organization Annex 1, <i>Personnel Licensing</i>

Each subject area has an objective. The objective lists the important knowledge and skill elements that must be utilized by the examiner in planning and administering aviation mechanic tests, and that applicants must be prepared to satisfactorily perform.

EXAMINER is used throughout this standard to denote either the FAA Inspector or FAA Designated Mechanic Examiner (DME) who conducts the practical test.

### **Use of the Practical Test Standards**

The FAA requires that all practical tests be conducted in accordance with the appropriate Aviation Mechanic Practical Test Standard, and the policies and procedures set forth in the current revision of FAA Order 8900.2.

When using the practical test standards, the examiner must evaluate the applicant's knowledge and skill in sufficient depth to determine that the objective for each subject area element selected is met. If the element selected in one subject area has already been evaluated in another area, they need not be repeated. For example, the applicant need not be evaluated in SUBJECT AREA H. MATHEMATICS, ELEMENT **H10**. Add, subtract, multiply, and divide positive and negative numbers (Level 3). If that ELEMENT was sufficiently observed during the completion of SUBJECT AREA C. WEIGHT AND BALANCE, ELEMENT **C4**. Compute forward and aft loaded c.g. (Level 3).

An applicant is not permitted to know before testing begins which selections in each subject area are to be included in his/her test. Therefore, an applicant should be well prepared in **all** oral and skill areas included in the practical test standard.

Further information and requirements for conducting a practical test is contained in FAA Order 8900.2.

### **Aviation Mechanic Practical Test Prerequisites**

All applicants must have met the prescribed experience requirements as stated in 14 CFR part 65, section 65.77 or be an authorized school student per 14 CFR part 65, section 65.80. (See FAA Order 8900.2 for information about testing under the provisions of 14 CFR part 65, section 65.80.)

### **Examiner Responsibility**

All applicants must demonstrate an approval for return to service standard, where applicable and demonstrate the ability to locate and apply the required reference materials, where applicable. In instances where an approval for return to service standard cannot be achieved, the applicant must be able to explain why the return to service standard was not met (e.g., when tolerances are outside of a product's limitations).

The examiner must personally observe all practical projects performed by the applicant. The examiner who conducts the practical test is responsible for determining that the applicant meets acceptable standards of knowledge and skill in the assigned subject areas within the appropriate practical test standard. Since there is no formal division between the knowledge and skill portions of the practical test, this becomes an ongoing process throughout the test.

The following terms may be reviewed with the applicant prior to, or during, element assignment.

1. **Inspect**—means to examine by sight and/or touch (with or without inspection enhancing tools/equipment).
2. **Check**—means to verify proper operation.
3. **Troubleshoot**—means to analyze and identify malfunctions.
4. **Service**—means to perform functions that assure continued operation.
5. **Repair**—means to correct a defective condition. Repair of an airframe or powerplant system includes component replacement and adjustment, but not component repair.
6. **Overhaul**—means disassembled, cleaned, inspected, repaired as necessary, and reassembled.

### **Performance Levels**

The following is a detailed description of the meaning of each level.

#### **Level 1**

- Know basic facts and principles.
- Be able to find information and follow directions and written instructions.
- Locate methods, procedures, instructions, and reference material.
- Interpretation of information not required.
- No skill demonstration is required.

#### **Example:**

**Z3b.** Locate specified nondestructive testing methods. (Level 1)

**Performance Standard:** The applicant will locate information for nondestructive testing.

## Level 2

- Know and understand principles, theories, and concepts.
- Be able to find and interpret maintenance data and information, and perform basic operations using appropriate data, tools, and equipment.
- A high level of skill is not required.

### Example:

**Z3c.** Detect electrical leakage in electrical connections, terminal strips, and cable harness (at least 10 will have leakage faults). (Level 2)

**Performance Standard:** Using appropriate maintenance data and a multimeter, the applicant will identify items with leakage faults.

## Level 3 (This is the approval for return to service standards).

- Know, understand, and apply facts, principles, theories, and concepts.
- Understand how they relate to the total operation and maintenance of aircraft.
- Be able to make independent and accurate airworthiness judgments.
- Perform all skill operations to a return-to-service standard using appropriate data, tools, and equipment. Inspections are performed in accordance with acceptable or approved data.
- A fairly high skill level is required.

### Example:

**Z3e.** Check control surface travel. (Level 3)

**Performance Standard:** Using type certificate data sheets and the manufacturer's service manual, the applicant will measure the control surface travel, compare the travel to the maintenance data, and determine if the travel is within limits.

## Satisfactory Performance

The practical test is passed if the applicant demonstrates the prescribed proficiency in the assigned elements in each subject area to the required standard. Applicants shall not be expected to memorize all mathematical formulas that may be required in the performance of various elements in this practical test standard. However, where relevant, applicants must be able to locate and apply necessary formulas to obtain correct solutions.

## **Unsatisfactory Performance**

If the applicant does not meet the standards of any of the elements performed (knowledge or skill elements), the associated subject area is failed, and thus the practical test is failed. The examiner or the applicant may discontinue testing any time after the failure of a subject area. In any case, the applicant is entitled to credit for only those subject areas satisfactorily completed. See the current revision of FAA Order 8900.2 for further information about retesting and allowable credit for subject areas satisfactorily completed.

Typical areas of unsatisfactory performance and grounds for disqualification include the following.

1. Any action or lack of action by the applicant that requires corrective intervention by the examiner for reasons of safety.
2. Failure to follow acceptable or approved maintenance procedures while performing projects.
3. Exceeding tolerances stated in the maintenance instructions.
4. Failure to recognize improper procedures.
5. The inability to perform to a return to service standard, where applicable.
6. Inadequate knowledge in any of the subject areas.



## **SECTION IV—POWERPLANT THEORY AND MAINTENANCE**

### **A. RECIPROCATING ENGINES**

REFERENCES: FAA-H-8083-32; AC 43.13-1B; 14 CFR part 43.

**Objective.** To determine that the applicant:

1. Exhibits knowledge in, as a minimum, two of the following elements—
  - a. reciprocating engine theory of operation.
  - b. basic radial engine design, components, and/or operation.
  - c. firing order of a reciprocating engine.
  - d. probable cause and removal of a hydraulic lock.
  - e. valve adjustment on a radial engine.
  - f. purpose of master and/or articulating rods.
  - g. checks necessary to verify proper operation of a reciprocating engine.
  - h. induction system leak indications.
  - i. reciprocating engine maintenance procedures.
  - j. procedures for inspecting various engine components during an overhaul.
  - k. correct installation of piston rings and results of incorrectly installed or worn rings.
  - l. purpose/function/operation of various reciprocating engine components, including, but not limited to, any of the following: crankshaft dynamic dampers, multiple springs for valves, piston rings, and reduction gearing.
2. Demonstrates skill to perform, as a minimum, one of the following elements—
  - A1. Inspect a cylinder. (Level 2)
  - A2. Remove and replace a stud. (Level 2)
  - A3. Dimensionally inspect a crankshaft. (Level 2)
  - A4. Install piston and/or knuckle pin(s). (Level 2)
  - A5. Install cylinder assembly on an engine. (Level 3)
  - A6. Identify the parts of a cylinder. (Level 2)
  - A7. Identify the parts of a crankshaft. (Level 2)
  - A8. Identify and inspect various types of bearings. (Level 2)
  - A9. Replace packing seals in a push rod housing. (Level 2)
  - A10. Check and/or rig cable and push-pull engine controls. (Level 3)
  - A11. Adjust valve clearances. (Level 3)

- A12.** Inspect engine mounts. (Level 3)
- A13.** Demonstrate engine starting procedures. (Level 3)
- A14.** Operate an aircraft engine. (Level 3)
- A15.** Perform a cold cylinder check. (Level 3)
- A16.** Locate top dead-center position of a piston. (Level 3)
- A17.** Check cylinder compression with differential compression tester. (Level 3)

## B. TURBINE ENGINES

REFERENCES: FAA-H-8083-32; AC 43.13-1B; 14 CFR part 43.

**Objective.** To determine that the applicant:

1. Exhibits knowledge in, as a minimum, two of the following elements—
  - a. turbine engine theory of operation.
  - b. checks necessary to verify proper operation.
  - c. turbine engine troubleshooting procedures.
  - d. procedures required after the installation of a turbine engine.
  - e. causes for turbine engine performance loss.
  - f. purpose/function/operation of various turbine engine components.
  - g. turbine engine maintenance procedures.
2. Demonstrates skill to perform, as a minimum, one of the following elements—
  - B1.** Identify characteristics of different turbine compressors. (Level 2)
  - B2.** Identify types of turbine blades. (Level 2)
  - B3.** Identify major components of turbine engines. (Level 2)
  - B4.** Identify airflow direction and pressure changes in turbojet engines. (Level 2)
  - B5.** Remove and install a combustion case and liner. (Level 3)
  - B6.** Remove and install a fuel nozzle in a turbine engine. (Level 3)
  - B7.** Inspect combustion liners. (Level 3)
  - B8.** Measure turbine rotor blade clearance. (Level 3)
  - B9.** Locate procedures for the adjustment of a fuel control unit. (Level 1)
  - B10.** Perform turbine engine inlet guide vane and compressor blade inspection. (Level 3)
  - B11.** Locate the installation or removal procedures of a turbine engine. (Level 1)
  - B12.** Locate procedures for trimming a turbine engine. (Level 1)
  - B13.** Identify damaged turbine blades. (Level 3)
  - B14.** Identify causes for engine performance loss. (Level 2)
  - B15.** Remove and/or install a turbine rotor disk. (Level 3)
  - B16.** Identify damaged inlet nozzle guide vanes. (Level 3)
  - B17.** Inspect the first two stages of a turbine fan or compressor for foreign object damage. (Level 3)

**NOTE:** T. AUXILIARY POWER UNITS may be tested at the same time as AREA B. No further testing of auxiliary power units is required.

## C. ENGINE INSPECTION

REFERENCES: FAA-H-8083-32; AC 43.13-1B; 14 CFR part 43.

**Objective.** To determine that the applicant:

1. Exhibits knowledge in, as a minimum, two of the following elements—
  - a. the use of a type certificate data sheet (TCDS) to identify engine accessories.
  - b. requirements for the installation or modification in accordance with a supplemental type certificate (STC).
  - c. procedures for accomplishing a 100-hour inspection in accordance with the manufacturer's instruction.
  - d. compliance with airworthiness directives.
  - e. changes to an inspection program due to a change or modification required by airworthiness directive or service bulletin.
  - f. determination of life limited parts.
  - g. inspection required after a potentially damaging event, including but not limited to any of the following: sudden stoppage, over speed, or over temperature.
2. Demonstrates skill to perform, as a minimum, one of the following elements—
  - C1.** Inspect an engine for compliance with applicable ADs. (Level 3)
  - C2.** Identify an engine by type without reference material other than the data plate. (Level 2)
  - C3.** Determine engine conformity with engine specifications or type certificate data sheet. (Level 3)
  - C4.** Construct a checklist for a 100-hour inspection on an engine. (Level 2)
  - C5.** Perform a portion of the 100-hour inspection on an engine. (Level 3)
  - C6.** Check engine controls for freedom of operation. (Level 3)
  - C7.** Inspect an engine for fluid leaks after performance of maintenance. (Level 3)
  - C9.** Inspect aircraft engine accessories for conformity. (Level 3)
  - C10.** Inspect aircraft engine for service bulletin compliance. (Level 3)
  - C11.** Inspect aircraft turbine engine for records time left on any life limited parts. (Level 3)
  - C12.** Perform an over temperature inspection. (Level 3)
  - C13.** Perform an engine over torque inspection. (Level 3)
  - C14.** Perform an aircraft engine over speed inspection. (Level 3)
  - C15.** Determine conformity of installed spark plugs or igniters. (Level 3)
  - C16.** Determine if aircraft engine maintenance manual is current. (Level 2)

## SECTION V—POWERPLANT SYSTEMS AND COMPONENTS

### H. ENGINE INSTRUMENT SYSTEMS

REFERENCES: FAA-H-8083-32; AC 43.13-1B.

**Objective.** To determine that the applicant:

1. Exhibits knowledge in, as a minimum, two of the following elements—
  - a. troubleshoot a fuel flow and/or low fuel pressure indicating system.
  - b. the operation of a fuel flow indicating system and where it is connected to the engine.
  - c. the operation of a temperature indicating system.
  - d. the operation of a pressure indicating system.
  - e. the operation of an revolutions per minute (RPM) indicating system.
  - f. required checks to verify proper operation of a temperature indicating system.
  - g. required checks to verify proper operation of a pressure indicating system.
  - h. required checks to verify proper operation of an RPM indicating system.
  - i. the operation of a manifold pressure gage and where it actually connects to an engine.
2. Demonstrates skill to perform, as a minimum, one of the following elements—
  - H1.** Remove, inspect, and/or install a fuel-flow transmitter. (Level 3)
  - H2.** Remove, inspect, and/or install fuel flow gage. (Level 3)
  - H3.** Identify various components installed on an engine. (Level 2)
  - H4.** Check fuel flow transmitter power supply. (Level 2)
  - H5.** Troubleshoot a fuel-flow system. (Level 3)
  - H6.** Inspect tachometer markings for accuracy. (Level 3)
  - H7.** Perform resistance measurements of thermocouple indication system. (Level 3)
  - H8.** Remove, inspect, and/or install turbine engine exhaust gas temperature (EGT) harness. (Level 3)
  - H9.** Troubleshoot a turbine engine pressure ratio (EPR) system. (Level 3)
  - H10.** Troubleshoot a tachometer system. (Level 3)

- H11.** Replace a cylinder head temperature thermocouple. (Level 3)
- H12.** Inspect EGT probes. (Level 2)
- H13.** Locate and inspect engine low fuel pressure warning system components. (Level 3)
- H14.** Check aircraft engine manifold pressure gage for proper operation. (Level 3)
- H15.** Inspect a leaking manifold pressure system. (Level 2)
- H16.** Repair a low oil pressure warning system. (Level 3)
- H17.** Troubleshoot an EGT indicating system. (Level 3)

## I. ENGINE FIRE PROTECTION SYSTEMS

REFERENCES: FAA-H-8083-32; AC 43.13-1B.

**Objective.** To determine that the applicant:

1. Exhibits knowledge in, as a minimum, two of the following elements—
  - a. checks to verify proper operation of an engine fire detection and/or extinguishing system.
  - b. troubleshoots an engine fire detection and/or extinguishing system.
  - c. inspection requirements for an engine fire extinguisher squib and safety practices/precautions.
  - d. components and/or operation of an engine fire detection and/or extinguishing system.
  - e. engine fire detection and/or extinguishing system maintenance procedures.
2. Demonstrates skill to perform, as a minimum, one of the following elements—
  - I1. Identify fire detection sensing units. (Level 2)
  - I2. Inspect fire detection continuous loop system. (Level 3)
  - I3. Inspect fire detection thermal switch or thermocouple system. (Level 3)
  - I4. Check and/or inspect a fire detection warning system. (Level 3)
  - I5. Locate troubleshooting information for a fire detection system. (Level 1)
  - I6. Inspect turbine engine fire detection system. (Level 3)
  - I7. Inspect engine fire extinguisher system blowout plugs. (Level 3)
  - I8. Inspect a turbine engine fire extinguisher agent container pressure. (Level 3)
  - I9. Check fire extinguisher discharge circuit. (Level 3)
  - I10. Troubleshoot a fire protection system. (Level 3)
  - I11. Inspect fire extinguisher carbon dioxide bottle. (Level 3)
  - I12. Repair fire detector heat sensing loop support clamps. (Level 3)
  - I13. Inspect a fire extinguisher container discharge cartridge. (Level 3)
  - I14. Inspect fire extinguisher system for hydrostatic test requirements. (Level 3)
  - I15. Check flame detectors for operation. (Level 3)
  - I16. Check operation of firewall shutoff valves. (Level 3)
  - I17. Check operation of master caution press-to-test and troubleshoot faults. (Level 2)
  - I18. Identify continuous-loop fire detection system components. (Level 2)

## **J. ENGINE ELECTRICAL SYSTEMS**

REFERENCES: FAA-H-8083-32; AC 43.13-1B.

**Objective.** To determine that the applicant:

1. Exhibits knowledge in, as a minimum, two of the following elements—
  - a. generator rating and performance data location.
  - b. operation of a turbine engine starter-generator.
  - c. the procedure for locating the correct electrical cable/wire size needed to fabricate a replacement cable/wire.
  - d. installation practices for wires running close to exhaust stacks or heating ducts.
  - e. operation of engine electrical system components.
  - f. types of and/or components of direct current (DC) motors.
  - g. inspection and/or replacement of starter-generator brushes.
2. Demonstrates skill to perform, as a minimum, one of the following elements—
  - J1. Use publications to determine replacement part numbers. (Level 2)
  - J2. Replace an engine-driven generator or alternator. (Level 3)
  - J3. Service an engine-driven DC generator in accordance with manufacturer's instructions. (Level 3)
  - J4. Parallel a dual-generator electrical system. (Level 3)
  - J5. Inspect an engine-driven generator or alternator. (Level 3)
  - J6. Troubleshoot a voltage regulator in an aircraft electrical generating system. (Level 2)
  - J7. Repair an engine direct-drive electric starter. (Level 3)
  - J8. Troubleshoot a direct-drive electric starter system. (Level 2)
  - J9. Fabricate an electrical system cable. (Level 3)
  - J10. Determine wire size for engine electrical system. (Level 2)
  - J11. Repair a broken engine electrical system wire. (Level 3)
  - J12. Replace a wire bundle lacing. (Level 3)
  - J13. Identify an engine system electrical wiring schematic. (Level 2)
  - J14. Fabricate a bonding jumper. (Level 3)
  - J15. Inspect a turbine engine starter generator. (Level 3)
  - J16. Fabricate solderless terminals. (Level 3)
  - J17. Inspect engine electrical connectors. (Level 3)



## **K. LUBRICATION SYSTEMS**

REFERENCES: FAA-H-8083-32; AC 43.13-1B.

**Objective.** To determine that the applicant:

1. Exhibits knowledge in, as a minimum, two of the following elements—
  - a. differences between straight mineral oil, ashless-dispersant oil, and synthetic oil.
  - b. types of oil used for different climates.
  - c. functions of an engine oil.
  - d. identification and selection of proper lubricants.
  - e. servicing of the lubrication system.
  - f. the reasons for changing engine lubricating oil at specified intervals.
  - g. the purpose and operation of an oil/air separator.
  - h. reasons for excessive oil consumption without evidence of oil leaks in a reciprocating and/or turbine aircraft engine.
2. Demonstrates skill to perform, as a minimum, one of the following elements—
  - K1.** Determine the correct type of oil for a specific engine. (Level 1)
  - K2.** Identify turbine engine oil filter bypass indicator. (Level 2)
  - K3.** Determine approved oils for different climatic temperatures. (Level 2)
  - K4.** Locate and describe procedures for changing turbine engine oil. (Level 1)
  - K5.** Inspect oil cooler and/or oil lines for leaks. (Level 3)
  - K6.** Inspect an oil filter or screen. (Level 3)
  - K7.** Check engine oil pressure. (Level 2)
  - K8.** Perform oil pressure adjustment. (Level 3)
  - K9.** Identify oil system components. (Level 2)
  - K10.** Replace an oil system component. (Level 3)
  - K11.** Identify oil system flow. (Level 2)
  - K12.** Service an oil tank. (Level 3)
  - K13.** Perform an engine pre-oil operation. (Level 3)
  - K14.** Troubleshoot an engine oil pressure malfunction. (Level 3)
  - K15.** Troubleshoot an engine oil temperature system. (Level 3)
  - K16.** Adjust oil Pressure. (Level 3)

## **L. IGNITION AND STARTING SYSTEMS**

REFERENCE: FAA-H-8083-32; AC 43.13-1B.

**Objective.** To determine that the applicant:

1. Exhibits knowledge in, as a minimum, two of the following elements—
  - a. troubleshooting a reciprocating and/or turbine engine ignition system.
  - b. replacement of an exciter box and safety concerns if the box is damaged.
  - c. troubleshooting a starter system.
  - d. checking a starter system for proper operation.
  - e. the operation of a pneumatic starting system.
  - f. reasons for the starter dropout function of a starter generator or pneumatic starter.
  - g. the purpose of a shear section in a starter output shaft.
  - h. purpose of checking a p-lead for proper ground.
  - i. inspection and servicing of an igniter and/or spark plug.
  - j. magneto systems, components, and operation.
  - k. function/operation of a magneto switch and p-lead circuit.
  - l. high and low tension ignition systems.
2. Demonstrates skill to perform, as a minimum, one of the following elements—
  - L1. Disassemble, identify components, and reassemble a magneto. (Level 3)
  - L2. Inspect magneto breaker points. (Level 3)
  - L3. Set internal timing of a magneto. (Level 3)
  - L4. Test high-tension leads. (Level 3)
  - L5. Remove and install an ignition harness. (Level 3)
  - L6. Check a magneto on a test bench. (Level 3)
  - L7. Check serviceability of condensers. (Level 3)
  - L8. Check ignition coils. (Level 3)
  - L9. Check ignition leads. (Level 3)
  - L10. Troubleshoot ignition switch circuit. (Level 3)
  - L11. Inspect and check gap of spark plugs. (Level 3)
  - L12. Replace spark plugs. (Level 3)
  - L13. Install and/or time a magneto on an engine. (Level 3)
  - L14. Troubleshoot a turbine or reciprocating engine ignition system. (Level 3)
  - L15. Replace turbine engine igniter plugs. (Level 3)
  - L16. Troubleshoot turbine engine igniters. (Level 3)
  - L17. Inspect turbine engine ignition system. (Level 3)
  - L18. Fabricate an ignition lead. (Level 3)

## **M. FUEL METERING SYSTEMS**

REFERENCE: FAA-H-8083-32; AC 43.13-1B.

**Objective.** To determine that the applicant:

1. Exhibits knowledge in, as a minimum, two of the following elements—
  - a. troubleshooting an engine that indicates high exhaust gas temperature (EGT) for a particular engine pressure ratio (EPR).
  - b. purpose of an acceleration check after a trim check.
  - c. reasons an engine would require a trim check.
  - d. purpose of the part power stop on some engines when accomplishing engine trim procedure.
  - e. procedure required to adjust (trim) a fuel control unit (FCU).
  - f. possible reasons for fuel running out of a carburetor throttle body.
  - g. indications that would result if the mixture is improperly adjusted.
  - h. procedure for checking idle mixture on a reciprocating engine.
  - i. possible causes for poor engine acceleration, engine backfiring or missing when the throttle is advanced.
  - j. types and operation of various fuel metering systems.
  - k. fuel metering system components.
2. Demonstrates skill to perform, as a minimum, one of the following elements—
  - M1.** Remove, inspect, and install a turbine engine fuel nozzle. (Level 3)
  - M2.** Identify carburetor components. (Level 2)
  - M3.** Interpret diagram showing fuel and air flow through float-type and/or pressure type carburetor. (Level 2)
  - M4.** Remove and/or install a main metering jet in a carburetor. (Level 3)
  - M5.** Service a carburetor fuel inlet screen. (Level 3)
  - M6.** Identify carburetor air-bleed system. (Level 2)
  - M7.** Identify the main discharge nozzle in a pressure carburetor. (Level 2)
  - M8.** Remove and/or install the accelerating pump in a float-type carburetor. (Level 3)
  - M9.** Check the float level on a float-type carburetor. (Level 3)
  - M10.** Remove and/or install the mixture control system in a float-type carburetor. (Level 3)

- M11.** Inspect float needle and/or seat in a float-type carburetor. (Level 3)
- M12.** Identify, remove, and/or install a float-type carburetor. (Level 3)
- M13.** Adjust idle speed and/or mixture. (Level 3)
- M14.** Inspect a turbine fuel control unit. (Level 3)
- M15.** Describe the conditions that may result in turbine engine RPM overspeed. (Level 2)
- M16.** Describe the conditions that may result in pressure carburetor engine with slow acceleration. (Level 2)
- M17.** Describe the conditions that may result in malfunctions in a pressure-injection carburetor fuel regulator unit. (Level 2)
- M18.** Replace a direct-injection fuel nozzle. (Level 3)
- M19.** Set or position fuel metering cockpit controls for engine start. (Level 2)

## **N. ENGINE FUEL SYSTEMS**

REFERENCES: FAA-H-8083-32; AC 43.13-1B.

**Objective.** To determine that the applicant:

1. Exhibits knowledge in, as a minimum, two of the following elements—
  - a. inspection requirements for an engine fuel system.
  - b. checks of fuel systems to verify proper operation.
  - c. troubleshooting an engine fuel system.
  - d. procedure for inspection of an engine driven fuel pump for leaks and security.
  - e. function and/or operation of one or more types of fuel pumps.
  - f. function and/or operation of one or more types of fuel valves.
  - g. function and/or operation of engine fuel filters.
2. Demonstrates skill to perform, as a minimum, one of the following elements—
  - N1.** Identify components of an engine fuel system. (Level 2)
  - N2.** Remove and/or install an engine-driven fuel pump. (Level 3)
  - N3.** Check a remotely operated fuel valve. (Level 3)
  - N4.** Rig a remotely operated fuel valve. (Level 3)
  - N5.** Inspect a main fuel filter assembly for leaks. (Level 3)
  - N6.** Check fuel boost pumps for correct pressure. (Level 2)
  - N7.** Remove and/or install a fuel boost pump. (Level 3)
  - N8.** Locate and identify a turbine engine fuel heater. (Level 2)
  - N9.** Check fuel pressure warning light function. (Level 2)
  - N10.** Adjust fuel pump fuel pressure. (Level 3)
  - N11.** Inspect engine fuel system fluid lines and/or components.(Level 3)
  - N12.** Troubleshoot abnormal fuel pressure. (Level 3)
  - N13.** Troubleshoot a turbine engine fuel heater system. (Level 3)
  - N14.** Remove, clean, and/or replace an engine fuel strainer. (Level 3)
  - N15.** Troubleshoot engine fuel pressure fluctuation. (Level 3)
  - N16.** Inspect fuel selector valve. (Level 3)
  - N17.** Determine correct fuel nozzle spray pattern. (Level 3)
  - N18.** Locate and identify fuel selector placards. (Level 2)

## O. INDUCTION AND ENGINE AIRFLOW SYSTEMS

REFERENCES: FAA-H-8083-32; AC 43.13-1B.

**Objective.** To determine that the applicant:

1. Exhibits knowledge in, as a minimum, two of the following elements—
  - a. inspection procedures for engine ice control systems and/or carburetor air intake and induction manifolds.
  - b. operation of an alternate air valve, both automatic and manual heat systems.
  - c. troubleshooting ice control systems.
  - d. explain how a carburetor heat system operates and the procedure to verify proper operation.
  - e. effect(s) on an aircraft engine if the carburetor heat control is improperly adjusted.
  - f. causes and effects of induction system ice.
  - g. function and operation of one or more types of supercharging systems and components.
2. Demonstrates skill to perform, as a minimum, one of the following elements—
  - O1. Inspect a carburetor preheat system. (Level 2)
  - O2. Check a carburetor heater box shutter for full travel. (Level 2)
  - O3. Check carburetor heat. (Level 3)
  - O4. Identify probable location of induction ice. (Level 2)
  - O5. Identify turbine engine air intake ice protected areas. (Level 2)
  - O6. Service an induction air filter. (Level 3)
  - O7. Inspect a turbocharger for exhaust leaks and security. (Level 2)
  - O8. Check a turbocharger for operation. (Level 3)
  - O9. Inspect an induction system for obstruction. (Level 3)
  - O10. Inspect an air intake manifold for leaks. (Level 3)
  - O11. Troubleshoot engine that idles poorly. (Level 2)
  - O12. Troubleshoot engine that fails to start. (Level 2)
  - O13. Identify components of a turbocharger induction system. (Level 2)
  - O14. Troubleshoot a carburetor heat system. (Level 2)
  - O15. Troubleshoot turbine engine air inlet ice protection system. (Level 2)
  - O16. Identify turboprop engine ice and rain protection system components. (Level 2)
  - O17. Remove, inspect, and/or install a turbocharger. (Level 3)
  - O18. Inspect a carburetor air inlet duct attachment. (Level 2)

## **P. ENGINE COOLING SYSTEMS**

REFERENCES: FAA-H-8083-32; AC 43.13-1B.

**Objective.** To determine that the applicant:

1. Exhibits knowledge in, as a minimum, two of the following elements—
  - a. required inspection on an engine cooling system.
  - b. operation of cowl flaps, and how cooling is accomplished.
  - c. how turbine engine cooling is accomplished.
  - d. cooling of engine bearings and other parts on turbine engines.
  - e. the importance of proper engine baffle and seal installation.
  - f. the operation of a heat exchanger.
  - g. the function and operation of an augmentor cooling system.
  - h. rotorcraft engine cooling systems.
2. Demonstrates skill to perform, as a minimum, one of the following elements—
  - P1.** Repair cylinder head baffle. (Level 3)
  - P2.** Inspect cylinder head baffle plates. (Level 2)
  - P3.** Check cowl flap travel. (Level 3)
  - P4.** Inspect cylinder cooling fins. (Level 2)
  - P5.** Repair cylinder cooling fin. (Level 3)
  - P6.** Identify location of turbine engine insulation blankets. (Level 2)
  - P7.** Identify turbine engine cooling air flow. (Level 2)
  - P8.** Troubleshoot a cowl flap system. (Level 3)
  - P9.** Troubleshoot an engine cooling system. (Level 3)
  - P10.** Identify exhaust augmentor cooled engine components. (Level 2)
  - P11.** Repair turbine engine insulation blankets. (Level 3)
  - P12.** Identify rotorcraft engine cooling components. (Level 2)
  - P13.** Troubleshoot rotorcraft engine cooling system. (Level 3)
  - P14.** Inspect rotorcraft engine cooling system. (Level 3)
  - P15.** Inspect engine exhaust augmentor cooling system. (Level 3)

## **Q. ENGINE EXHAUST AND REVERSER SYSTEMS**

REFERENCES: FAA-H-8083-32; AC 43.13-1B.

**Objective.** To determine that the applicant:

1. Exhibits knowledge in, as a minimum, two of the following elements—
  - a. exhaust leak indications and/or methods of detection.
  - b. thrust reverser system operation and components.
  - c. differences between a cascade and a mechanical blockage door thrust reverser.
  - d. hazards of exhaust system failure.
  - e. effects of using improper materials to mark on exhaust system components.
  - f. function and operation of various exhaust system components.
2. Demonstrates skill to perform, as a minimum, one of the following elements—
  - Q1.** Identify the type of exhaust system on a particular aircraft. (Level 2)
  - Q2.** Inspect exhaust system components. (Level 2)
  - Q3.** Repair exhaust system components. (Level 3)
  - Q4.** Clean exhaust system components. (Level 2)
  - Q5.** Inspect reciprocating engine exhaust system. (Level 3)
  - Q6.** Inspect exhaust system internal baffles or diffusers. (Level 3)
  - Q7.** Remove and install exhaust ducts. (Level 3)
  - Q8.** Inspect exhaust heat exchanger. (Level 3)
  - Q9.** Remove and install a heat exchanger collector tube. (Level 3)
  - Q10.** Perform a heat exchanger collector tube leak test. (Level 3)
  - Q11.** Inspect a turbine engine exhaust nozzle. (Level 3)
  - Q12.** Check turbine thrust reverser system. (Level 3)
  - Q13.** Troubleshoot a thrust reverser system. (Level 2)
  - Q14.** Troubleshoot exhaust muffler heat exchanger. (Level 2)
  - Q15.** Repair exhaust system leak. (Level 3)
  - Q16.** Locate procedures for performing exhaust system leak checks. (Level 2)



## **R. PROPELLERS**

REFERENCES: FAA-H-8083-32; AC 43.13-1B.

**Objective.** To determine that the applicant:

1. Exhibits knowledge in, as a minimum, two of the following elements—
  - a. propeller theory of operation.
  - b. checks necessary to verify proper operation of propeller systems.
  - c. procedures for proper application of propeller lubricants.
  - d. installation or removal of a propeller.
  - e. measurement of blade angle with a propeller protractor.
  - f. repairs classified as major repairs on an aluminum propeller.
  - g. reference data for reducing the diameter of a type certificated propeller.
  - h. operation of propeller system component(s).
  - i. propeller governor components and operation.
  - j. theory and operation of various types of constant speed propellers.
  - k. function and operation of propeller synchronizing systems.
  - l. function and operation of propeller ice control systems.
2. Determine what minor propeller alterations are acceptable using the appropriate type certificate data sheet. (Level 2) and a minimum of at least one of the following—
  - R1.** Perform propeller lubrication. (Level 3)
  - R2.** Locate the procedures for balancing a fixed-pitch propeller. (Level 1)
  - R3.** Remove, inspect, and/or install a propeller governor. (Level 3)
  - R4.** Remove and/or install a propeller. (Level 3)
  - R5.** Check track of a propeller. (Level 3)
  - R6.** Adjust a propeller governor. (Level 3)
  - R7.** Determine propeller blade pitch angle. (Level 3)
  - R8.** Determine propeller critical range of operation. (Level 2)
  - R9.** Describe the operation of a propeller. (Level 2)
  - R10.** Inspect a wooden propeller metal tipping. (Level 3)
  - R11.** Check propeller blade feather angle. (Level 3)
  - R12.** Repair metal propeller leading edges, trailing edges or tips that have nicks, scratches, and cuts. (Level 3)
  - R13.** Clean an aluminum alloy propeller. (Level 2)
  - R14.** Inspect a turboprop propeller system. (Level 3)
  - R15.** Perform a 100-hour inspection on a propeller. (Level 3)
  - R16.** Troubleshoot a turboprop propeller system. (Level 3)
  - R17.** Repair anti-icing or de-icing system on a propeller. (Level 2)

## **S. TURBINE POWERED AUXILIARY POWER UNITS**

REFERENCE: FAA-H-8083-32; AC 43.13-1B.

**Objective.** To determine that the applicant:

1. Exhibits knowledge in, as a minimum, two of the following elements—
  - a. inspection to ensure proper operation of turbine driven auxiliary power unit.
  - b. replacement procedure for an igniter plug.
  - c. servicing an auxiliary power unit.
  - d. troubleshooting an auxiliary power unit.
  - e. function and operation of auxiliary power unit(s).

**NOTE:** Subject area S, AUXILIARY POWER UNITS, may be tested at the same time as AREA B, TURBINE ENGINES. No further testing of auxiliary power units is required.